

Applic. No.: 10/689,419

Amdt. Dated July 29, 2005

Reply to Office action of May 9, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claim 1 (currently amended). A semiconductor module, comprising:

a plurality of contact terminals used for external data interchange, address interchange and/or command interchange during normal operation;

at least one further contact terminal not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module; and

a main circuit for testing the semiconductor module, said main circuit connected to said further contact terminal and configured such that a mode of operation for ascertaining and outputting test information during the normal operation of the semiconductor module may be initialized and set through said further contact terminal, it being possible to simultaneously carry out data interchange, address interchange and/or command

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interchange during the normal operation of the semiconductor module through said contact terminals;

said main circuit including:

a first reception circuit connected to said further contact terminal for receiving and decoding an input code sequence for initializing a test sequence or a configuration sequence; and

a second reception circuit coupled to said further contact terminal for receiving and decoding a function code sequence for setting the test sequence or the configuration sequence, said second reception circuit being released, once the input code sequence has been received and decoded, by said first reception circuit, for the purpose of receiving the function code sequence, it being possible, once the function code sequence has been received and decoded, for said second reception circuit to be used to set the mode of operation for ascertaining and outputting test information and, respectively, for configuring the semiconductor module during the normal operation of the semiconductor module.

Claim 2 (cancelled).

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Claim 3 (currently amended). The semiconductor module according to claim [[2]] 1, wherein said first reception circuit contains:

a first shift register connected to said further contact terminal for serially receiving input code signal sequences;

a first register circuit for storing a digitally coded input code;

a first comparison circuit connected to and comparing contents of said first shift register and of said first register circuit; and

a first enable circuit connected to said further contact terminal and to said second reception circuit, said first enable circuit being driven by said first comparison circuit.

Claim 4 (original). The semiconductor module according to claim 3, wherein:

said main circuit contains a sub-circuit selected from the group consisting of a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor

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module and a configuration circuit for configuring the semiconductor module; and

said second reception circuit contains:

a second shift register connected to said first reception circuit and serially receiving function code signal sequences;

a second register circuit for storing digitally coded function codes;

a second comparison circuit connected to and comparing contents of said second shift register and of said second register circuit; and

a second enable circuit coupled to said further contact terminal and to one of said measurement circuit and said configuration circuit, said second enable circuit being driven by said second comparison circuit.

Claim 5 (original). The semiconductor module according to claim 4, wherein said measurement circuit for ascertaining test data regarding the method of operation of the semiconductor module contains:

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a third shift register coupled to said further contact terminal and serially receiving parameter signal sequences for executing a test sequence;

a control unit connected to said third shift register and to said second reception circuit; and

a measurement unit connected to and controlled by said control unit and measuring electrical parameters for ascertaining test data regarding the method of operation of the semiconductor module.

Claim 6 (original). The semiconductor module according to claim 4, wherein said configuration circuit for configuring the semiconductor module contains:

a third shift register connected to said further contact terminal and serially receiving parameter signal sequences for executing a configuration process;

a control unit connected to said third shift register and to said second reception circuit; and

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a configuration register connected to said control unit and storing configuration settings.

Claim 7 (original). The semiconductor module according to claim 1, further comprising:

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

an output circuit coupled to said further contact terminal and to said measurement circuit, said output circuit outputting the test data which have been ascertained toward an outside through said further contact terminal.

Claim 8 (original). The semiconductor module according to claim 1, further comprising:

at least one additional further contact terminal which is not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module;

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

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an output circuit connected to said additional further contact terminal and to said measurement circuit, said output circuit outputting the test data which have been ascertained toward an outside through said additional further contact terminal.

Claim 9 (original). The semiconductor module according to claim 1, further comprising:

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

an output circuit connected to at least one of said contact terminals and to said measurement circuit, said output circuit outputting the test data which have been ascertained toward and outside through said one of said contact terminals.

Claim 10 (original). The semiconductor module according to claim 8, wherein said output circuit is connected to said main circuit for testing the semiconductor module, said main circuit for testing the semiconductor module enabling said output circuit for outputting the test data which have been ascertained.

Claim 11 (original). The semiconductor module according to claim 7, wherein said output circuit can be used to output

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both analog and digital test data toward an outside through said further contact terminal.

Claim 12 (currently amended). A semiconductor module, comprising:

a plurality of contact terminals used for external data interchange, address interchange and/or command interchange during normal operation of the semiconductor module;

at least one further contact terminal not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module; and

a main circuit for configuring the semiconductor module, said main circuit connected to said further contact terminal and configured such that a mode of operation for configuring the semiconductor module during the normal operation may be initialized and set through said further contact terminal, it being possible to simultaneously carry out data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module through said contact terminals;

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said main circuit containing:

a first reception circuit connected to said further contact terminal for receiving and decoding an input code sequence for initializing a test sequence or a configuration sequence; and

a second reception circuit coupled to said further contact terminal for receiving and decoding a function code sequence for setting the test sequence or the configuration sequence, said second reception circuit being released, once the input code sequence has been received and decoded, by said first reception circuit, for the purpose of receiving the function code sequence, it being possible, once the function code sequence has been received and decoded, for said second reception circuit to be used to set a mode of operation for ascertaining and outputting test information and, respectively, for configuring the semiconductor module during the normal operation of the semiconductor module.

Claim 13 (currently amended). The semiconductor module according to claim 12, further comprising a configuration register for storing configuration settings for configuring the semiconductor module provided by parameter signal

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sequences applied to said at least one further contact terminal not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module and connected to said main circuit.

Claim 14 (currently amended). The semiconductor module according to claim [[12]] 13, wherein said configuration register is a mode register.

Claim 15 (cancelled).

Claim 16 (currently amended). The semiconductor module according to claim [[15]] 12, wherein said first reception circuit contains:

a first shift register connected to said further contact terminal and serially receiving input code signal sequences;

a first register circuit for storing a digitally coded input code;

a first comparison circuit connected to and comparing contents of said first shift register and of said first register circuit; and

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a first enable circuit connected to said further contact terminal and to said second reception circuit, said first enable circuit being driven by said first comparison circuit.

Claim 17 (original). The semiconductor module according to claim 16, wherein:

said main circuit contains a sub-circuit selected from the group consisting of a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module and a configuration circuit for configuring the semiconductor module; and

said second reception circuit contains:

a second shift register connected to said first reception circuit and serially receiving function code signal sequences;

a second register circuit for storing digitally coded function codes;

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a second comparison circuit connected to and comparing contents of said second shift register and of said second register circuit; and

a second enable circuit coupled to said further contact terminal and to one of said measurement circuit and said configuration circuit, said second enable circuit being driven by said second comparison circuit.

Claim 18 (original). The semiconductor module according to claim 17, wherein said measurement circuit for ascertaining test data regarding the method of operation of the semiconductor module contains:

a third shift register coupled to said further contact terminal and serially receiving parameter signal sequences for executing a test sequence;

a control unit connected to said third shift register and to said second reception circuit; and

a measurement unit connected to and controlled by said control unit and measuring electrical parameters for ascertaining test data regarding the method of operation of the semiconductor module.

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Claim 19 (original). The semiconductor module according to claim 17, wherein said configuration circuit for configuring the semiconductor module contains:

a third shift register coupled to said further contact terminal and serially receiving parameter signal sequences for executing a configuration process;

a control unit connected to said third shift register and to said second reception circuit; and

a configuration register connected to said control unit and storing configuration settings.

Claim 20 (original). The semiconductor module according to claim 12, further comprising:

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

an output circuit connected to said further contact terminal and to said measurement circuit, said output circuit outputting the test data which have been ascertained toward an outside through said further contact terminal.

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Claim 21 (original). The semiconductor module according to claim 12, further comprising:

at least one additional further contact terminal which is not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module;

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

an output circuit connected to said additional further contact terminal and to said measurement circuit, said output circuit outputting the test data which have been ascertained toward an outside through said additional further contact terminal.

Claim 22 (original). The semiconductor module according to claim 12, further comprising:

a measurement circuit for ascertaining test data regarding a method of operation of the semiconductor module; and

an output circuit connected to at least one of said contact terminals and to said measurement circuit, said output circuit

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outputting the test data which have been ascertained toward an outside through said one of said contact terminals.

Claim 23 (original). The semiconductor module according to claim 21, wherein said output circuit is connected to said main circuit for testing the semiconductor module, said main circuit for testing the semiconductor module enabling said output circuit for outputting the test data which have been ascertained.

Claim 24 (original). The semiconductor module according to claim 20, wherein said output circuit can be used to output both analog and digital test data toward an outside through said further contact terminal.

Claim 25 (currently amended). A method for functionally testing a semiconductor module having a plurality of contact terminals provided for external data interchange, address interchange and/or command interchange during normal operation of the semiconductor module and at least one further contact terminal not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module, which comprises the step of:

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initializing and setting a mode of operation for ascertaining and outputting test information during the normal operation of the semiconductor module through the further contact terminal, with data interchange, address interchange and/or command interchange simultaneously being effected during the normal operation of the semiconductor module through the contact terminals;

performing an input code evaluation by interrogating a state of the further contact terminal, the evaluation being executed until an interrogated input code for initializing a test sequence or a configuration sequence matches a predetermined input code;

performing a function code evaluation by interrogating a state of the further contact terminal if a result of the input code evaluation is positive, the evaluation being executed until an interrogated function code for setting a test sequence or a configuration sequence matches a predetermined function code;
and

subsequently outputting test information during the normal operation of the semiconductor module or configuring the semiconductor module.

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Claim 26 (cancelled).

Claim 27 (currently amended). The method according to claim
[[26]] 25, which further comprises:

performing a parameter evaluation for executing the test
sequence or the configuration sequence by interrogating the
state of the further contact terminal if a result of the
function code evaluation is positive; and

subsequently outputting the test information during the normal
operation of the semiconductor module or configure the
semiconductor module.

Claim 28 (original). The method according to claim 26, which
further comprises:

decoding an output start command at the further contact
terminal for outputting the test information; and

outputting the test information through another contact
terminal until an output stop command is decoded at the
further contact terminal.

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Claim 29 (currently amended). A method for configuring a semiconductor module having a plurality of contact terminals used for external data interchange, address interchange and/or command interchange during normal operation of the semiconductor module and at least one further contact terminal not used for external data interchange, address interchange and/or command interchange during the normal operation of the semiconductor module, which comprises the steps of:

initializing and setting a mode of operation for configuring the semiconductor module during the normal operation of the semiconductor module through the further contact terminal, with data interchange, address interchange and/or command interchange simultaneously being effected during the normal operation of the semiconductor module through the contact terminals;

performing an input code evaluation by interrogating a state of the further contact terminal, the evaluation being executed until an interrogated input code for initializing a test sequence or a configuration sequence matches a predetermined input code;

performing a function code evaluation by interrogating the state of the further contact terminal if a result of the input

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code evaluation is positive, the evaluation being executed until an interrogated function code for setting the test sequence or the configuration sequence matches a predetermined function code; and

subsequently outputting test information during the normal operation of the semiconductor module or configuring the semiconductor module.

Claim 30 (cancelled).

Claim 31 (currently amended). The method according to claim [[30]] 29, which further comprises:

performing a parameter evaluation for executing the test sequence or the configuration sequence by interrogating the state of the further contact terminal if a result of the function code evaluation is positive; and

subsequently outputting the test information during the normal operation of the semiconductor module or configure the semiconductor module.

Claim 32 (currently amended). The method according to claim[[30]] 29, which further comprises:

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decoding an output start command at the further contact terminal for outputting the test information; and

outputting the test information through another contact terminal until an output stop command is decoded at the further contact terminal.

Claim 33 (new). The semiconductor module according to claim 13, wherein said parameter signal sequences include parameters for the purpose of setting an operating voltage of the module.